Karlo Kauko

Managers and efficiency in banking

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Abstract

This paper presents evidence on the impact of managers on cost efficiency in banking. Stochastic frontier analysis is applied to a unique Finnish data set. The paper finds that manager age and education have strong yet complicated effects. University education enhances efficiency if the manager is running a large bank. Managing director changes are systematically followed by efficiency changes. Manager retirement typically causes an efficiency improvement, whereas other manager changes can either improve or weaken efficiency.

Keywords: efficiency, banking, managers

JEL classification numbers: G21, L25, M19

Johtajat ja tehokkuus pankkitoiminnassa

Suomen Pankin keskustelualoitteita 11/2007

Karlo Kauko
Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Tässä keskustelualoitteessa tarkastellaan johtajien vaikutuksia pankkien kustannustehokkuuteen. Työssä sovelletaan satunnaisen rintaman estimointia ainutlaatuiseen suomalaisista pankeista koostuvaan aineistoon. Toimitusjohtajan iällä ja koulutuksella on voimakkaita, joskin monimutkaisia vaikutuksia. Yliopistokoulutus edistää tehokkuutta, jos johtaja on vastuussa suuresta pankista. Johtajan vaihtumista yleensä seuraa tehokkuuden muutos. Eläkkeelle jääminen useimmiten aiheuttaa tehokkuuden kasvun, kun taas muut johtajanvaihdokset voivat joko heikentää tai parantaa tehokkuutta.

Avainsanat: tehokkuus, pankkitoiminta, johtajat

JEL-luokittelu: G21, L25, M19

Contents

1 Introduction

Bank efficiency studies have become an established field of empirical economics. These studies have developed a relatively standardised methodology and conceptual framework. A central term in this literature is 'managerial efficiency', which simply refers to the ability of a bank to maximise profits or minimise costs under given circumstances. This expression attributes efficiency to managers. Paradoxically, there seem to be almost no empirical studies on the relevance of managers to managerial efficiency in banking.

This paper is an attempt to shed some light on this issue. Following Fries and Taci (2005), Sensarma (2006) and Kraft, Hofler and Payne (2006), the stochastic frontier analysis (SFA) method of Battese and Coelli (1995) is used to derive cost efficiency estimates. Bank output is defined according to the production approach. A unique, detailed balanced panel data set on Finnish cooperative and savings banks is used. The data set is very well suited for analysing this question because it includes systematically collected and detailed personal information on hundreds of bank managers; few data sets of this kind are available.

It is found that age and education affect performance in cost minimisation, but these effects seem to be rather complicated. University graduates have a comparative advantage in running relatively large banks. Managers with university degrees in business administration or economics seem to outperform their colleagues with a university degree in law or agriculture and forestry. Vocational level qualification in business administration seems to be an excellent educational background in very small banks. Among young managers efficiency improves as a function of age but among the oldest efficiency deteriorates. Manager changes are systematically followed by above average changes in efficiency. If an old manager retires, a significant cost efficiency improvement typically follows. In other cases efficiency is affected, but there is no regularity in the direction of change.

Previous literature is reviewed in section 2. Section 3 describes the data. The method and the specification are presented in section 4. Empirical results are presented in section 5. Section 6 summarises and discusses the findings.

2 Literature

Efficiency has different established definitions in previous literature. The most common of them seems to be cost efficiency, which simply refers to the ability of the bank to avoid unnecessary costs, when input prices and the quantity and composition of output are given. This efficiency concept has often been used as the only definition.[1] The two profit efficiency concepts refer to the ability to maximise profits under prevailing circumstances; they are normally used simultaneously with the cost efficiency concept.[2]

In most efficiency analyses the logarithmic objective is regressed on variables that would affect the value of the objective function in the case of a fully efficient institution; for instance, logarithmic costs are normally regressed on different transformations and interactions of input prices, output quantities and possible other variables. OLS analysis is seldom used in bank efficiency studies. Stochastic frontier analysis (SFA) is one of the most popular methods. SFA decomposes the error term into the expected value of inefficiency and random variation, such as measurement error. The random error may be either positive or negative. In cost functions the inefficiency term is always positive because it increases costs. The cost function of a completely efficient institution in absence of random factors is called the efficient frontier.

Many studies on the determinants of efficiency use a two-stage approach. First, efficiency scores for individual banks are estimated by using the SFA. As a second step the statistical interrelationship between efficiency and its potential determinants is analysed using other statistical methods.[3] This approach, however, may lead to biased results, especially if the determinants of efficiency correlate with variables included in the cost function. The Battese-Coelli (1995) method does not suffer from this problem. The impact of inefficiency determinants is estimated simultaneously with the efficient frontier itself by using an iterative maximum likelihood procedure. Each observation of the sample is assigned an inefficiency estimate that partly depends on these determinants. In recent years the method has been gaining ground in bank efficiency literature. Three recent papers have used its presumably superior ability to provide estimates on the impact of different factors on banks' cost efficiency; Fries and Taci (2005) analysed banks from various transition countries, Sensarma (2006) the Indian banking sector and Kraft, Hofler and Payne (2006) Croatian banks. These papers largely concentrated on the impact of ownership. Williams and Nguyen (2005) used the method in their analysis on profit efficiency and bank governance in South East Asia.

As to measuring output, banking may be one of the most difficult industries. The production approach assumes that the bank produces certain financial services, such as loans, deposits and payment intermediation. The choice of services included in the output vector is often based on subjective discretion. It has been commonplace to use the number of accounts and loans as output

[1] Pi and Timme (1993), Weill (2004), Rezvanian and Mehdian (2002), Humphrey and Vale (2004), Prior (2003), Dietsch and Lozano-Vivas (2000), Fries and Taci (2005), Matoušek and Taci (2004), Sensarma (2006), Esho (2001), Girardone, Molyneyx and Gardener (2004), Kraft, Hofler and Payne (2006), to mention a few.

[2] See eg Berger and Mester (1997), Altunbas, Evans and Molyneux (2001), Koetter (2006).

[3] See eg Bonin, Hasan and Wachtel (2005), Bos and Kool (2006), Clark and Siems (2002), Kwan (2006), Carbo, Gardener and Williams (2002), Girardone, Molyneux and Gardener (2004).

indicators, but it is equally possible to use balance sheet data. Bank costs are defined as personnel and other operational costs. Interest expenditure is ignored. This approach used to be very commonplace.[4] Its popularity seems to have declined, but in recent years it has been used by at least Prior (2003). The intermediation approach considers deposits as inputs and includes interest expenditure in costs. The value-added approach considers deposits simultaneously an output and an input; interest expenditure is included in costs but the quantity of deposits is included in the output vector.

Input prices are essential to efficiency estimations. Traditionally, it has been commonplace to calculate the price of inputs at the bank level. For instance, the price of labour has been calculated by dividing staff costs by the number of employees. However, in a perfectly competitive market all banks should face identical factor prices. If the market is not perfectly competitive, factor prices should be endogenous. Mountain and Thomas (1999) may have been the first to discuss these issues in detail. One method to avoid the problem is to calculate averages for each geographic area and to use the average for all the banks of the region. This method has been used by at least Koetter (2006) and Bos and Kool (2006). According to Koetter (2006), the problems of bank specific input price proxies are particularly accentuated in cost function estimations.

There are a few person related factors that can be measured in an objective way. The most obvious of them is education. The human capital theory pioneered by Becker (1962) assumes that education creates valuable human capital. The signalling theory, largely due to Spence (1973), assumes that skilled individuals acquire education to signal their type. Both theories suggest that education should correlate with efficiency. Testing the theories against each other is difficult because they both yield rather similar empirical predictions. Riley (2001) reviews the empirical evidence and the findings seem to be conflicting.

Perhaps surprisingly, there seem to be very little econometric research on the impact of manager characteristics on bank performance. However, CEO shareholdings weaken cost efficiency among US banks (Pi and Timme, 1993). Branch manager turnover correlates with bad loans, presumably because local management gradually accumulates tacit knowledge on local borrowers (Ferri, 1997). As to non-bank financial institutions, the impact of fund manager educational background on the performance of a securities portfolio has been analysed (Gottesman and Morey, 2006, Chevalier and Ellison, 1999).

Cooperative banks may have an informational advantage over limited liability banks because members of credit cooperatives normally live in the same community, and they are often engaged in similar activities. If default by one debtor causes losses to peers, borrowers would monitor each other in joint-liability arrangements (Ghatak, 2000). Alternatively non-borrower members may

[4] See the appendix 1 of the review article of Clark (1988).

monitor debtors (Banerjee, Besley and Guinnane, 1994). Australian credit cooperatives seem to pass on the benefits of cost efficiency to members by lowering their interest rate spreads (Esho, 2001).

3 The data

The data set contains information on 309 Finnish savings and cooperative banks for which data are available for the years 1999–2004; the balanced sample consists of 1854 observations. These banks are small by any standards, which is no problem. In a very small organisation every employee may report directly to the managing director, making managerial skills easier to detect than in large organisations. Almost all these banks have branches in one geographic region only. Accounting data are from a confidential Financial Supervision Authority (FSA) supervisory database, and they are more detailed than information found in public sources.

The banks can be divided into three different groups. The largest of them consists of 230 member banks of the consortium of cooperative banks.[5] These banks operate in close cooperation and they are even responsible for each others' debts. The second largest group consists of 42 local cooperative banks. These banks also cooperate, although without mutual responsibility for each others' commitments. The third group of banks consists of 37 savings banks. Two of these three groups are denoted with dummy variables (Group1, Group2); because of data confidentiality the identity of these groups cannot be disclosed.

Data on banks' managing directors are also from a confidential FSA database. The data contain the name and the date of birth of former and current board members and managing directors of all the supervised entities. Precise dates when the person assumed the position and when the tenure ended are also recorded. These data are complete. Moreover, the database contains information on managers' education, but unfortunately in about 36% of cases this information is missing. In the following analyses, managers' education is characterised by the following six dummy variables; UAgSil = +1 if the manager has a university degree in agriculture and/or silviculture, zero otherwise; UBusEcon = university degree in business administration, economics or finance, ULaw = university degree in law, UOther = university degree in other disciplines (typically in social sciences), VocBus = vocational qualification in business administration, Other = other non-university education (typically in agriculture).

Managers whose education is not reported are typically in charge of relatively small institutions. The median real Tier1 capital in millions of 2004 euros is 5.0

[5] This group is sometimes called the OP bank group or Okobank group, even though strictly speaking Okobank is a commercial bank largely owned by other members of the consortium.

for banks whose manager's education is not reported, 4.1 for banks with a managing director without university degree and 8.4 for banks whose managers have university degrees. This may imply that relatively many managers whose education is not reported have no university degrees.

Table 3.1 **The proportion of different educational achievements in the sample; the average age of managers according to education**

	UAgSil	UBusEcon	Ulaw	Uother	VocBus	Other	Missing
Share in 1999	4.5%	12.0%	11.7%	4.2%	20.1%	10.0%	37.5%
Share in 2004	5.5%	12.3%	12.6%	5.2%	18.8%	10.0%	35.6%
Average age in 1999	45	46	45	47	49	52	49
Average age in 2004	48	49	48	49	52	53	51

Three manager tenure length dummies are defined. Less2y equals +1 if the manager has held the position for less than two years as of 1st of January. Less5y equals +1 if the manager has held the position for at least two but less than five years. Over15y denotes cases where the manager has held the position for more than 15 years.

The production approach is used to define bank output. The intermediation approach and the value added approach consider interest expenditure an ordinary cost, which would not be a meaningful assumption in the case of these banks. At least savings banks should have no reason to avoid paying high deposit rates whenever they can afford it. The Savings Bank Act stipulates that the objective of these institutions is to promote saving. With the exception of limited liability savings banks not included in the sample, these institutions have no owners in the traditional meaning of the word. They do not normally distribute profits. The managing director is chosen by the board, which is nominated by the trustees of the savings bank. The trustees are elected either directly or indirectly by depositors. Hence, managers' principals represent depositors. Depositor wealth maximisation requires minimisation of administrative expenses but is normally inconsistent with profit maximisation.

As to cooperative banks, the situation is somewhat similar. Each member of a cooperative bank has one vote in the members' meeting, which is the highest decision making body of the institution. This meeting chooses the supervisory board, which chooses the managing director. Members can benefit from their bank in two different ways. Firstly, cooperative banks can offer fee discounts to their members. Secondly, members often receive a kind of dividend payout. Thus, a well governed cooperative bank has a multi-variable objective function consisting of both profits and members' possibilities to use advantageous services. The explicit payout to members is taxable whereas discounts on financial services are not, making direct profit sharing less attractive. Offering discount prices is often inconsistent with profit maximisation, but cost efficiency helps to offer attractive fees.

Banks are assumed to have four outputs, namely transaction account deposits, other deposits, housing loans and other claims on the public and public sector entities. Transaction accounts may be a satisfactory proxy for the amount of payment services provided to customers. Housing loans are defined as loans secured by mortgages on residential property in the Basel I system. Other loans are calculated by subtracting housing loans from claims on the public and public sector entities. Each balance sheet item is calculated as the average of four quarterly observations of the year. Variables are made real by dividing them by the wholesale price index.

Table 3.2 **Distribution of variables; thousands of real 2004 euros; 6*309 = 1854 observations**

	10 percentile	*Lower quartile*	*Median*	*Upper quartile*	*90 percentile*
Loans excl housing loans	4 779	9 708	16 282	29 466	56 923
Housing loans	4 089	7 343	13 548	29 344	76 305
Demand deposits	4 221	8 604	17 983	40 320	83 840
Other deposits	3 928	7 625	16 187	30 567	59 192
Tier 1 capital	1 735	2 927	5 227	9 331	18 172
Costs	308	502	822	1 504	3 314
Age of the manag dir	39	44	50	55	58

Because exogenous input prices are preferable to bank-specific estimates in cost efficiency estimations (Mountain and Thomas, 1999, Koetter, 2006), input prices are assumed to be equal for all banks in the same region. Unlike in many previous contributions, input prices are from general statistical sources. Labour costs are based on the wage index of financial sector employees. This index is adjusted by taking into account the mandatory pension insurance fee. The average annual increase of nominal labour price during the observation period was 4.4%. The GDP deflator of the sector 'services to the business sector and real estate' is the second input price; it includes services related to IT, marketing, legal issues, real estate, human resources management, security etc. The average annual increase of this price index was 4.7%.

Bank costs are measured by the profit and loss account item '*administrative expenses*'. This cost item contains personnel costs, ICT costs, marketing expenditure, office supplies etc. This concept does not include '*other operating expenses*', which mainly consists of real estate costs and statutory fees, such as contributions to the deposit insurance fund and supervision fees charged by the

FSA. These statutory fees are not particularly relevant to cost efficiency because they could not be legally avoided without suspending operations. It may be more problematic to exclude real estate costs. Including them would also be problematic because buildings are both an input and an output. Small Finnish banks often use rental real estate, mainly business property, as an investment asset. In the light of book values, about 47% of sample banks' real estate was not used by the banks themselves. Data on rental income is available, but it is difficult to calculate the bank specific quantity of real estate 'output' because rents differ substantially between towns and no regional rental market data is available. Real estate is not necessarily marked to the market. It is probably consistent to ignore real estate both as an output and as an input. The bias in costs may not be particularly dangerous because the sum of other operating expenses and depreciation on buildings is less than one third of administrative expenses. Moreover, administrative expenses probably make a satisfactory proxy for other operating expenses. At the bank level the correlation between administrative expenses and other operating expenses was +0.96 in 2004, if one does not control for bank size.

Geographic factors are controlled for by ten dummy variables. Nine dummy variables denote the first digit of the postal code. Each of these variables refers to a relatively cohesive geographic area. Areas close to the capital with postal codes beginning with 0 remain the reference case. Factor prices may differ between urban and other areas; the dummy variable URBAN denotes banks headquartered in urban municipalities with more than 50 000 inhabitants.

Table 3.3 **Geographic distribution of sample banks**

Region	*Non-urban*	*Urban*	*Banks in total*
0	11	0	11
1	23	0	23
2	45	2	47
3	53	1	54
4	16	2	18
5	19	2	21
6	48	1	49
7	27	1	28
8	34	1	35
9	21	2	23
Whole country	297	12	309

The size of the bank is used as a potential determinant of efficiency. The balance sheet total would probably be a problematic size indicator because it is highly endogenous and largely determined by items classified as outputs, by either the supply of deposits or the demand for loans. The tier 1 capital is less endogenous. At least in the case of lending, it is an essential determinant of capacity.

4 The model

Unlike many previous contributions, this paper does not analyse commercial banks. It is far from obvious that savings banks and cooperative banks would maximise profits. Hence, profit efficiency is not necessarily a relevant concept, and this paper focuses solely on cost efficiency.

Following Fries and Taci (2005), Kraft, Hofler and Payne (2006) and Sensarma (2006), inefficiencies in banks are estimated by applying the Battese – Coelli (1995) stochastic frontier estimation to a cost function. The logarithmic cost of the bank i period t is assumed to equal

$$Ln(c_{it}) = f(x_{it}, p_t) + V_{it} + U_{it} \tag{4.1}$$

Where f is the so-called deterministic kernel, ie the costs of a fully efficient institution in absence of random factors, which is a function of the output vector x_{it} and input price vector p_t. V_{it} is a normally distributed random error with mean zero. U_{it} is undue costs caused by inefficiency.

$$U_{it} = m_{it} + W_{it} \tag{4.2}$$

where W_{it} is a random variable, such that U_{it}s are non-negative truncations of the distribution N (m_{it}, σ^2), when m_{it} is defined as

$$m_{it} = \delta_0 + \sum_{j=1}^{N} Z_{jit}\delta_j \tag{4.3}$$

where Z_{jit} is the jth inefficiency determinant (Z variable) of the bank i year t and δs (delta coefficients) are parameters to be estimated. If $m_{it} \geq 0$, it is also the mode of the distribution. In the following, m_{it} will loosely be called the mode, even though whenever m_{it} is negative it does not even belong to the support of U_{it}.

Possible differences in input prices between regions can be taken into account in the deterministic kernel by introducing geographic effects as simple dummy variables, as interactions with outputs, and as interactions with relative input prices. (See Appendix 1) Any regional factors other than differences in input prices probably affect the coefficients of the geographic dummy variables, which should not be a problem.

The cost function is the standard translog specification complemented with trigonometric terms. The importance of trigonometric terms is stressed by eg Huang and Wang (2004), Humphrey and Vale (2004) and Kraft, Hofler and Payne (2006). Following numerous contributions,[6] Fourier terms are applied only for outputs. Following Berger and Mester (1997) and Kraft, Hofler and Payne (2006), linear homogeneity in input prices is imposed on the cost function by dividing both costs and other factor prices by one factor price, which in this case is the GDP deflator of services to the business sector (p_2). The final specification is

$$
\begin{aligned}
\mathrm{Ln}(C/p_2) &= \beta_0 + \sum_{i=1}^{4}\beta_i \mathrm{Ln}(Q_i/p_3) + \theta_0 \mathrm{Ln}(p_1/p_2) + \\
&+ \sum_{i=1}^{4}\theta_i \mathrm{Ln}(Q_i/p_3)\mathrm{Ln}(p_1/p_2) + \theta_5[\mathrm{Ln}(p_1/p_2)]^2 + \\
&+ \sum_{i=1}^{4}\sum_{j=i}^{4}\Psi_{ij}\mathrm{Ln}(Q_i/p_3)\mathrm{Ln}(Q_j/p_3) + \varpi_1 T + \varpi_2 T^2 + \sum_{i=1}^{4}\Lambda_i T\mathrm{Ln}(Q_i/p_3) + \alpha T\mathrm{Ln}(p_1/p_2) + \\
&+ \sum_{i=1}^{10}\varsigma_i G_i + \sum_{i=1}^{10}\sum_{j=1}^{4}\mu_{ij} G_i \mathrm{Ln}(Q_j/p_3) + \sum_{i=1}^{10}\phi_i G_i \mathrm{Ln}(p_1/p_2) + \\
&+ \sum_{i=1}^{4}\Omega_i \mathrm{Sin}(Y_i) + \sum_{i=1}^{4}\xi_i \mathrm{Cos}(Y_i) + \sum_{i=1}^{4}\sum_{j=i}^{4}\eta_{ij}\mathrm{Sin}(Y_i+Y_j) + \sum_{i=1}^{4}\sum_{j=i}^{4}\Gamma_{ij}\mathrm{Cos}(Y_i+Y_j) + \\
&+ \sum_{i=1}^{4}\sum_{j=i}^{4}\sum_{k=j}^{4}\left[\zeta_{ijk}\,\mathrm{Sin}(Y_i+Y_j+Y_k) + \gamma_{ijk}\,\mathrm{Cos}(Y_i+Y_j+Y_k)\right] + U + V
\end{aligned}
\tag{4.4}
$$

The first four lines include all the terms of the translog cost function. The last two rows include the trigonometric add-on terms. C is the administrative expenses of the bank during the year in question, p_1 is the labour cost index of the financial services sector, p_2 is the GDP deflator of services to the business sector, p_3 is the wholesale price index, Qs are the four outputs, T is the trend, Y_i is the real, non-logarithmic output i (Q_i/p_3) scaled between 0.1Π and 1.9Π,[7] G_i is the geographic dummy variable i , U is the inefficiency term, V is the normally distributed error and all the Greek letters are parameters to be estimated. The variables C, Q and Y are both bank and year specific whereas the variables p_1, p_2, p_3 and T are year specific but common to all banks.

[6] Altunbas, Evans and Molyneux (2001), Girardone, Molyneux and Gardener (2004), Carbo, Gardener and Williams (2002) and Williams and Nguyen (2005).

[7] For each observation $Y_i = 1.8\Pi\,[(Q_i/p_3)\text{-Min}(Q_i/p_3)]/[\text{Max}(Q_i/p_3)\text{-Min}(Q_i/p_3)]+0.1\Pi$, where Y_i is the scaled output item i, Q_i is the original, nominal output, Min(Q_i/p_3) is the lowest value of real output Q_i/p_3 in the whole sample of 1854 observations, Max (Q_i/p_3) the largest real output and $\Pi \approx 3.14159\ldots$ Similar transformations have been used in bank efficiency estimations by eg Carbo, Gardener and Williams (2002), Altunbas, Evans and Molyneux (2001), Williams and Nguyen (2005), Girardone, Molyneux and Gardener (2004), Berger and Mester (1997) and Kraft, Hofler and Payne (2006). The endpoints close to 0 and 2Π are normally excluded to avoid the problems discussed by Gallant (1981).

Efficiency is determined as a function of several variables, most of them being related to the managing director. Both the signalling theory and the human capital theory predict that education should improve efficiency. It is possible that experience, proxied by age, and education are either complements or substitutes. Preferable manager characteristics may depend on the size of the bank. Therefore, a large number of interaction effects are allowed to affect efficiency.

The age of the managing director is measured as the difference between the current year and the year of birth. At least according to stereotypic beliefs, people may become less energetic and slower to adopt new ideas when they grow older. An education acquired decades ago may be obsolete. On the other hand, mature age persons have accumulated substantial amounts of work and life experience, which may help them to avoid misjudgements. Because the impact of age on performance may be non-linear, the squared value of age is used in addition to the age itself.

The most comprehensive specification is the following.

$$m_{it} = \delta_0 + \delta_1 \text{ Group1} + \delta_2 \text{ Group2} + \delta_3\text{Age} + \delta_4\text{Age}^2 + \delta_5\text{UAgSil} + \delta_6\text{UBusEcon} + \delta_7\text{ULaw} + \delta_8\text{Uother} + \delta_9\text{VocBA} + \delta_{10}\text{Other} + \delta_{11}\text{LnTier1*UAgSil} + \delta_{12}\text{LnTier1*UBusEcon} + \delta_{13}\text{LnTier1*ULaw} + \delta_{14}\text{LnTier1*Uother} + \delta_{15}\text{LnTier1*VocBA} + \delta_{16}\text{LnTier1*Other} + \delta_{17}\text{LnTier1*Age} + \delta_{18}\text{Age*UAgSil} + \delta_{19}\text{Age*UBusEcon} + \delta_{20}\text{Age*ULaw} + \delta_{21}\text{Age*UOther} + \delta_{22}\text{Age*VocBA} + \delta_{23}\text{Age*Other} + \delta_{24}\text{LnTier1} + \delta_{25} \text{ Less2y} + \delta_{26} \text{ Less5y} + \delta_{27}\text{Over15y} \quad (4.5)$$

LnTier1 is the logarithmic real tier 1 capital, which is an indicator of bank size. Unlike in many other contributions, loan losses and non-performing loans are ignored. Credit risk may be a major factor in banking, but during the sample period loan losses of all the sample banks were negligible, and they declined from 0.1% of claims on customers in 1999 to almost zero in 2004.

The estimation is based on the assumption that observable manager characteristics affect efficiency, not vice versa. The mechanisms behind possible correlations between costs, Z variables of the data and unobserved factors may be more complicated. This issue will be discussed further in conclusions. In the light of some preliminary estimations, this problem may not be particularly serious.

5 Results

5.1 Different specifications and inefficiency determinants

Various model specifications were estimated with the Battese-Coelli (1995) method. Some basic statistics on the results are presented in table 5.1. Model 0 has the full deterministic kernel but no manager specific variables as efficiency determinants. In statistical terms, the performance is weak relative to models 1–2 and 4–7, but efficiency estimates derived without manager specific information are needed in section 5.2.

The full-scale model 1 includes all the potential variables of the deterministic kernel and all the efficiency determinants of equation (4.5). It was systematically tested which blocks of variables could be dropped off without significant loss of explanatory power. In the light of the lambda values reported in table 5.1, no other variables than the manager tenure length dummies can be excluded; this specification is numbered 2. The insignificance of tenure length is corroborated by the low asymptotic t-values of tenure length delta coefficients of model 1 reported in table 5.2. The high lambda coefficients of models 4–7 in table 5.1 imply that other blocks of Z variables have statistically significant explanatory power. Even the model 4 is rejected at the 5% level if the lambda value is calculated against the model 2. The high lambda value of model 3 implies that there is statistically significant evidence on the importance of interactions between geographic effects and other cost determinants. Hence, on statistical grounds the model 2 can be used as the main model.

There are differences in the cost efficiency of different banking groups. The reference group is more efficient than the first group. If one re-runs the model 2 and denotes the first and the third groups with dummy variables, the positive coefficient of the first group dummy is significant at the 5% level; the first group is statistically significantly less efficient than the second group.

As expected, manager age affects efficiency in a non-linear way. Among the youngest efficiency improves as a function of age but among the oldest the opposite is true. If one ignores the relatively large standard errors and accepts the delta coefficients of model 2 as such, efficiency is predicted to reach its optimum at the age of 46 and to deteriorate thereafter, when education is unknown and the manager is running a bank of median size. The optimal age varies between 30 and 57, depending on education. Small banks are more likely to suffer from cost inefficiency, even though the explanatory power of Tier1 capital is not particularly strong.

Table 5.1 **Models estimated with the full sample of 309 banks and 6 years of data using the Battese-Coelli (1995) method**

Lambda = -2 [LLF (Model to be tested) – LLF (Model 1)]; the probability values of the last column are based on Kodde and Palm (1986); gamma = $\sigma^2/(\sigma^2 + \sigma^2_v)$; σ^2 is the variance of the normal distribution on which the truncated distribution of W is based on; σ^2_v is the variance of the normally distributed random error V.

Model nr	Excluded variables	Determi-nants of inefficiency (Z variables)	Expla-natory variables in the kernel	Average ineffi-ciency	Log likeli-hood	Lambda against model 1	P(lambda) - chi squared distribu-tion	Gamma	LR test for one sided error	Prob of one sided error, mixed chi squared
0	All the manager specific inefficiency determinants	3	155	7.3 %	1 534.6	103.16	0.000	0.29	32.7	0.000
1	Full scale model - nothing excluded	27	155	10.7 %	1 586.2			0.34	135.8	0.000
2	Managing director tenure length dummies	24	155	10.4 %	1 585.8	0.80	0.850	0.33	135.0	0.000
3	Tenure length dummies, interactions of geographic dummy variables in the kernel	24	105	10.8 %	1 466.5	239.41	0.000	0.08	208.1	0.000
4	Tenure length dummies and Ln(Tier 1)	23	155	9.1 %	1 582.9	6.63	0.157	0.32	129.1	0.000
5	Tenure length dummies and interactions between manager education and Tier 1 capital	18	155	4.1 %	1 569.3	33.77	0.000	0.09	102.0	0.000
6	Tenure lenth dummies and interactions between manager age and education	18	155	3.8 %	1 540.6	91.21	0.000	0.005	44.5	0.001
7	Manager age, manager age squared and tenure length dummies	22	155	8.3 %	1 573.8	24.78	0.000	0.26	110.9	0.000

Interestingly, the impact of education on performance is very complicated and not always easy to understand. As the high lambda values of models 5 and 6 indicate, the interactions of education with bank size and manager age are highly significant. Because understanding the impact of different educational variables on efficiency is rather difficult in the presence of all the interaction effects of model 2, a few illustrative examples are presented in table 5.3. The example values of bank size and manager age refer to the 10^{th}, 50^{th} and 90^{th} percentiles of sample distributions. In the case of a median size bank, the manager should preferably have a university degree in business administration or in fields classified as 'other'. A non-university degree in business administration can also be a good educational background, especially in the smallest banks of the sample. A degree in jurisprudence does not predict good performance in cost minimisation, except among the youngest. As a rule, university graduates have a comparative advantage in managing large banks, which is intuitive.

Differences between different types of managers are not negligible. For instance, in the case of a median size bank, the difference between the lowest and the highest mode is 0.17. In the whole sample, the standard deviation of model 2 modes is only 0.11.

There is at least one obvious pattern in the manager specific components of efficiency modes. Educational background matters among the oldest, but among the youngest it seems to be of limited relevance. If managers are running median size banks, the difference between the highest and lowest efficiency mode estimate in table 5.4 is 0.07 at the age of 39. At the age of 58, it is 0.17. This result is rather difficult to interpret; neither the human capital theory, nor the signalling theory provides us with obvious explanations.

Table 5.2 **Delta coefficients of models 0, 1, 2, 4 and 7; asymptotic t values in parentheses**

	Model 0	Model 1	Model 2	Model 4	Model 7
Constant	0.15	0,57	0,58	0,20	0,11
	(2.9)	(3.1)	(3.0)	(0.6)	(5.3)
Group1	0,066	0,080	0,079	0,070	0,070
	(4.3)	(5.2)	(4.9)	(2.9)	(3.3)
Group2	0,024	0,038	0,037	0,040	0,034
	(1.8)	(2.0)	(1.9)	(0.9)	(1.3)
Age		-0,018	-0,018	-0,010	
		(-2.3)	(-2.3)	(-0.5)	
Age^2		1,8E-04	1,9E-04	9.24E-05	
		(2.4)	(2.3)	(0.6)	
UAgSil		-0,18	-0,18	-0,36	-0,19
		(-1.4)	(-1.2)	(-1.5)	(-1.1)
UBusEcon		0,069	0,067	0.081	0,147
		(0.6)	(0.5)	(0.3)	(1.1)
ULAw		-0,22	-0,21	-0,34	-0,20
		(-2.2)	(-1.9)	(-1.8)	(-1.4)
Uother		0,31	0,30	0,50	0,39
		(2.3)	(2.1)	(2.2)	(2.3)
VocBA		0,17	0,18	0,58	0,19
		(2.3)	(2.2)	(4.1)	(1.7)
Other		0,15	0,15	0,26	0,16
		(1.6)	(1.4)	(1.3)	(1.2)
Ln(Tier1)*UAgSil		-0,10	-0,10	-0,14	-0,09
		(-3.4)	(-3.0)	(-3.4)	(-3)
Ln(Tier1)*UBusEcon		-0,068	-0,069	-0.136	-0,067
		(-2.4)	(-2.2)	(-2.7)	(-2.2)
Ln(Tier1)*ULaw		-0,051	-0,051	-0.111	-0,053
		(-2.5)	(-2.1)	(-3.4)	(-2)
Ln(Tier1)*UOther		-0,141	-0,146	-0.149	-0,142
		(-1.9)	(-1.8)	(-3.5)	(-2.9)
Ln(Tier1)*VocBA		-0,012	-0,015	-0.082	0,023
		(-0.8)	(-0.8)	(-3.9)	(1.4)
Ln(Tier1)*Other		-0,043	-0,044	-0.073	-0,039
		(-2.2)	(-1.9)	(-1.7)	(-1.3)
Ln(Tier1)*Age		0,001	0,001	-0.001	0,001
		(0.7)	(0.6)	(-2.7)	(0.8)
Age*UAgSil		0,006	0,006	0.010	0,006
		(2.0)	(1.7)	(2.0)	(1.5)
Age*UBusEcon		-0,001	-0,001	-0.001	-0,003
		(-0.4)	(-0.3)	(-0.2)	(-0.9)
Age*ULaw		0,006	0,006	0.009	0,005
		(2.7)	(2.3)	(2.2)	(1.7)
Age*Uother		-0,005	-0,004	-0.009	-0,007
		(-1.6)	(-1.4)	(-1.5)	(-1.6)
Age*VocBA		-0,004	-0,004	-0.013	-0,005
		(-2.7)	(-2.5)	(-4.3)	(-2.1)
Age*Other		-0,003	-0,003	-0.005	-0,003
		(-1.5)	(-1.4)	(-1.4)	(-1.2)
Ln(Tier1)	-0.003	-0,090	-0,087		-0,066
	(-4.5)	(-2.0)	(-1.8)		(-1.3)
Less2y		0,008			
		(0.6)			
Less5y		-2,1E-06			
		(0.0)			
Over15y		0,007			
		(0.8)			

Table 5.3 **Examples of the mode of inefficiency distributions (m_{it}) as a function of managing director age and education, with different values of tier 1 capital of the bank**

Figures based on model 2 delta coefficients; all the direct and interaction effects of education, age and bank size taken into account. Nominal tier 1 capital must be divided by the wholesale price index (2004: 1711) before entering it into the equation implied by model 2; Group1=Group2=0 in all the examples

	Tier1 = 5227 Age = 50	*Tier1 = 5227 Age = 39*	*Tier1=5227 Age = 58*	*Tier1 = 1735 Age = 50*	*Tier1 = 18172 Age = 50*
UAgSilv	0.08	0.02	0.15	0.26	-0.12
UBusEcon	0.02	0.04	0.04	0.17	-0.14
ULaw	0.09	0.04	0.16	0.22	-0.04
UOther	0.00	0.05	-0.01	0.23	-0.26
VocBA	0.03	0.08	0.02	0.11	-0.06
Other	0.04	0.08	0.05	0.16	-0.09
Missing	0.08	0.09	0.11	0.15	0.01

5.2 Managers and efficiency changes

The high lambda value of model 0 in table 5.1 implies that manager characteristics predict efficiency. It has been assumed that this is not due to the tendency of certain types of banks to recruit certain types of managers. Instead, the results were interpreted as causalities running from manager characteristics to efficiency. If this is the correct interpretation, manager changes should be followed by above average efficiency changes. The 110 banks with at least two different managing directors between January 1999 and December 2004 were selected for further analysis.

If two banks have same costs and identical outputs, the Battese-Coelli method may assign them different efficiency estimates. If a bank has efficiency determinants typical for inefficient institutions, the cost function residual is interpreted as inefficiency (U_{it}) rather than mere random noise (V_{it}). When analysing how manager changes cause changes in efficiency, efficiency estimates should not be derived from manager specific information. Therefore, estimates based on model 0 were used. The explained variable could be the absolute value of the difference of inefficiency. This variable measures change irrespective of its direction. The distribution of this variable is skewed because most of the changes are close to zero, and a few extreme observations account for most of the variance, as can be seen in column 2 of table 5.4. But, as can be seen in column 3, the logarithm of this variable is much more evenly distributed. Moreover, because the non-logarithmic variable cannot be negative even though most observations are close to zero, and because panel estimations with truncated explained variables pose problems (see eg Baltagi 2001, 212–214), the analysis is facilitated if the explained variable is made non-truncated by the logarithmic transformation.

Table 5.4 **Distributional data on estimated efficiency changes**

Sub sample of 110 banks; 2000–2004; N=550

	1 $Ln(U_{it}/U_{it-1})$	2 $Abs(U_{it} - U_{it-1})$	3 $Ln[Abs(U_{it} - U_{it-1})]$
Min	-1.67	0.00003	-10.27
25 percentile	-0.16	0.004	-5.42
Median	-0.04	0.010	-4.65
Average	-0.04	0.016	-4.77
75 percentile	0.08	0.020	-3.91
Maximum	1.81	0.109	-2.21
Skewness	0.03	2.15	-0.93

This logarithmic efficiency change was regressed on the dummy variable NEWBOSS and the lagged value of efficiency, which was used as a control variable. NEWBOSS equals +1 if the managing director changed during the year, zero otherwise. As equation 1 of table 5.5 demonstrates, a new managing director affects efficiency already during the same year, and the impact continues during the following year. The statistical significance of cross-section fixed effects implies that there are relatively persistent differences in efficiency 'volatility'.

Unfortunately the data does not tell the reason why a bank got a new managing director. However, if the old manager had reached a certain age, retirement is the most likely reason. The dummy variable RETIRED denotes cases where the exiting manager was at least 60 years old. The variable OTHERCH denotes manager changes in other cases, and it is calculated by subtracting RETIRED from NEWBOSS. There are 37 presumed retirements and 84 other manager changes.

Equation 2 in table 5.5 implies that the lagged impact on efficiency is stronger if the manager retires than if the former manager left for other reasons. If all the extreme cases where the explained variable is lesser than -8 are excluded, like in equation 5, the results are weaker but the evidence on the impact of manager changes on efficiency is still clear. A lagged manager change affects efficiency stronger than a non-lagged change.

Table 5.5 **Panel estimation results; determinants of change of efficiency**

Sub sample of 110 banks in equations 1–4; Wald test F stat for equal coefficients of $RETIRED_{t-1}$ and $OTHERCH_{t-1}$ in eq 2 = 4.20**; 8 extreme observations with explained variable < -8 eliminated in equation 5.

PANEL LEAST SQUARES

Explained variable $Ln[Abs(U_{it}-U_{it-1})]$
110 cross sections; 550 observations in equations 0-4
Fixed cross-section effects and period effects in equations 1-5

	No fixed effects *0*	*1*	*2*	*3*	*4*	N=538 *5*
Constant	-2.70 (-8.0)***	-2.70 (-3.2)***	-2.68 (-3.2)***	-2.65 (-3.0)***	-2.55 (-3.2)***	-2.89 (-2.7)***
$NEWBOSS_t$	0.23 (1.8)*	0.26 (3.1)***				
$NEWBOSS_{t-1}$	0.36 (2.5)**	0.44 (3.4)***				
$OTHERCH_t$			0.26 (2.5)**	0.26 (2.5)**		0.14 (1.1)
$OTHERCH_{t-1}$			0.34 (3.1)***	0.33 (3.1)***		0.23 (2.0)**
$RETIRED_t$			0.27 (1.3)		0.25 (1.2)	0.24 (1.2)
$RETIRED_{t-1}$			0.64 (3.2)***		0.64 (3.2)***	0.52 (3.4)***
$Ln(U_{it-1})$	0.89 (8.5)***	0.88 (2.6)***	0.89 (2.6)***	0.88 (2.5)**	0.91 (2.8)***	0.75 (1.8)*
LLF	-865.06	-785.64	-784.96	-789.72	-788.41	-673.29
F-stat	21.14	2.22	2.18	2.13	2.16	2.63
R squared	0.16	0.37	0.37	0.36	0.37	0.43

White cross-section t statistics in parentheses
Statistical significance * = 10 % level; ** = 5 % level; *= 1 % level**

Redundant fixed effects in eq 1; Period effects F-test 2.9, chi-squared 14.6***; Cross-section F-test 1.2*, chi-squred 147.1***;**

The same explanatory variables were used to explain the simple logarithmic difference of inefficiency. The high significance of cross-sectional fixed effects in equation 1 implies that there are bank-specific trends in levels, which may not be surprising. As can be seen in equation 1 in table 5.6, efficiency typically improves when a new managing director enters. The equations 2 and 4 demonstrate that if a manager retires, cost efficiency improves. Equations 2 and 3 find no statistically significant regularity in case of other manager changes. Extreme cases where the absolute value of the difference between U_{it} and U_{it-1} is greater than 0.05 were excluded in equation 5, leaving us 467 observations. The main conclusions remain unaffected.

Table 5.6 **Panel estimation results; determinants of the logarithmic difference of model 0 inefficiency**

Extreme changes excluded in equation 5; banks with below median tier 1 capital year t excluded in equation 6

PANEL LEAST SQUARES							
Explained variable $Ln(U_{it}/U_{it-1})$							
Full sample 110 cross sections; 550 observations in equations 0-4							
Fixed cross-section effects and period effects in equations 1-6							
	No fixed effects					N=467	N=286
	0	*1*	*2*	*3*	*4*	*5*	*6*
Constant	-0.30	-2.20	-2.20	-2.21	-2.21	-1.53	-2.13
	(-6.6)***	(-7.0)***	(-6.9)***	(-6.9)***	(-6.9)***	(-5.3)***	(-5.0)***
$NEWBOSS_t$	-0.02	-0.02					
	(-1.3)	(-1.8)					
$NEWBOSS_{t-1}$	-0.04	-0.05					
	(-2.0)**	(-3.5)***					
$OTHERCH_t$			0.01	0.01		-0.02	0.06
			(0.4)	(0.4)		(-1.4)	(1.4)
$OTHERCH_{t-1}$			-0.03	-0.03		-0.02	0.00
			(-1.4)	(-1.3)		(-0.7)	(0.1)
$RETIRED_t$			-0.07		-0.07	-0.08	-0.13
			(-2.8)***		(-2.7)***	(-2.9)***	(-3.4)***
$RETIRED_{t-1}$			-0.10		-0.09	-0.09	-0.09
			(-3.9)***		(-3.8)***	(-3.0)***	(-4.3)***
$Ln(U_{it-1})$	-0.11	-0.87	-0.87	-0.87	-0.87	-0.59	-0.79
	(-6.3)***	(-6.9)***	(-6.8)***	(-6.8)***	(-6.9)***	(-5.3)***	(-5.0)***
LLF	11.81	192.82	195.30	190.70	194.53	311.44	136.25
F-stat	12.73	3.98	3.96	3.92	4.03	2.24	2.91
R squared	0.07	0.52	0.52	0.51	0.52	0.43	0.52

White cross-section t statistics in parentheses
Statistical significance * = 10 % level; ** = 5 % level; ***= 1 % level
Redundant fixed effects in eq 1; Period effects F-test 10.1***, chi-squared 49.0***; Cross-section F-test 3.7***, chi-squared 359.2***;

Manager salary is included in bank costs. Is it possible that manager retirement improves cost efficiency because old managers are possibly paid higher wages than young ones? It has been argued that it is rational to pay senior employees more than what their productivity would justify because young employees are motivated by deferred compensation and hopes of growing old in the firm (Lazear, 1981). If such compensation practices are in place in sample banks, the cost savings due to manager retirement should be particularly strong in small banks where manager salary is probably a more important expenditure item in relative terms. An estimation was run with a sub-sample consisting of observations where the bank had a tier1 capital of more than EUR 5.4 million in 2004 euros, which is the mean for this sub-sample in 1999–2004. The results are reported in the 6th equation of table 5.6; contrary to expectations, if any difference exists, retirement enhances efficiency particularly strongly in the largest sample banks.

It is not obvious that manager changes can be treated as exogenous events. An endogeneity test was carried out analogously to the conventional Hausman test using the added variable approach. Instruments included manager tenure length dummies, manager age variables, group dummy variables and past level of inefficiency. There was no statistically significant evidence of manager change endogeneity problems, neither in table 5.5, nor in table 5.6.

The FSA data contains detailed information on the breakdown of costs. The six most extreme efficiency improvements that coincide with manager retirement were reviewed. In two cases efficiency improved because of strong growth in output. In three cases there was an overall decrease in nearly all kinds of costs. In one case the improvement may be an one-off phenomenon related to the retirement of the managing director; pension insurance expenditure was abnormally high during the previous year, but almost zero during the year of manager retirement.

6 Conclusions and discussion

This paper has presented some evidence on the impact of managers on cost efficiency. The sample consists of 1854 observations on 309 savings and cooperative banks in 1999–2004. Each observation is assigned an efficiency estimate by running Battese and Coelli (1995) stochastic frontier translog cost function estimations. Bank output is defined according to the production approach.

There is strong statistical evidence on the impact of age and education on performance in cost minimisation, but these effects seem to be rather complicated. In very small banks a vocational level qualification in business administration seems to be the best education, in somewhat larger banks a university degree in business administration or economics is the best educational background. If an old manager retires, a significant cost efficiency improvement typically follows. Other manager changes also affect efficiency, but both improvements and deteriorations are equally possible. The optimal age of a managing director depends on the educational background.

The results were not obtained in controlled experiments. Underlying manager selection and self-selection processes have probably been very complicated. Most mature managers of the sample have been recruited by the industry decades ago. Banking groups' recruitment policies and the attractiveness of the banking industry among young graduates may have varied, implying that if two persons are born different years but have the same education, they are not equally likely to have been employed by banks. Employees who have left cooperative and savings banks are probably no random draw either. Managers with vocational level qualifications in business administration may appear successful because the most skilled of them may have been promoted to management. Instead of being promoted, the best lawyers recruited by these banks may have been offered higher paying positions in major commercial banks. This hypothetical adverse selection would be able to create the impression that mature lawyers seldom make good managers. It is easy to present a very large number of these kinds of hypothetical selection effects. They may cause complicated statistical dependencies between age, education and various unobserved personality characteristics.

Some hypotheses of this kind can be tested, and some of the results may be worth brief reviewing. One might suggest that the sample has been partly selected by boards' practice to lay off poor performers. If, for instance, university graduates are tolerated even if they perform poorly whereas inefficient managers without university degree are laid off, university graduates' performance may appear poor. These kinds of hypotheses, however, are not corroborated by the data. In logit estimations with the full sample of 309 banks there seemed to be no evidence at all in favour of the hypothesis that lagged bank efficiency (in levels) would predict non-retirement manager changes. Interactions of efficiency and manager education seem to be equally irrelevant. (See Appendix 2) Managers may be laid off because of poor performance, and boards' propensity to lay them off may correlate with observable manager characteristics, but best performers may leave equally systematically because of other reasons, making it impossible to detect the effect. As already mentioned, manager changes seemed to pass a simple endogeneity test in section 5.2. The results of a few failed experiments may be worth mentioning. In the sub-sample used in section 5.2, future manager changes did not explain efficiency changes in panel estimations, implying that the causality probably runs from manager changes to efficiency changes rather than in the opposite direction. Moreover, attempts to explain the age and education of entering new managers by past efficiency proved equally unsuccessful.

In addition to differences in skills and efforts, we may have measured differences in objectives. Some managers may not try to minimise costs because they are unwilling to lay off loyal employees in high unemployment areas. Some managers may pursue social status by hiring as many subordinates as possible. It is difficult to test whether these kinds of phenomena are present in the sample.

Because hardly any research on the impact of bank manager characteristics on cost efficiency has been published, there are many open questions for further research. The data does not contain much explicit information on experience. Banking groups have internal training programmes, and their impact on efficiency could be estimated. Psychometric test results on cognitive skills and other personality characteristics might also be available, and they might have predictive power as efficiency determinants. Testing these kinds of effects would be relatively simple if suitable data were available.

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Appendix 1

Let us assume the price of the factor 1 in a given geographic area is g_1 times the reference area price, and the price of the factor 2 is g_2 times the reference area price. The relative prices in the equation to be estimated can be decomposed into reference area relative prices and a region specific effect captured by the simple dummy variable.

$$\beta_n Ln\ \{g_1p_1/(g_2p_2)\} = \beta_n Ln\ (p_1/p_2) + \beta_n Ln(g_1/g_2)$$

If relative input prices in the reference area differ from the national average reported in aggregate statistics, the coefficient β_n captures this difference. The value of $Ln(g_1/g_2)$ is unknown, but the coefficient of the geographic dummy variable adjusts accordingly.

As to the interaction between factor prices and outputs, the situation is relatively straightforward; the interactions of geographic factors and outputs must be included in the deterministic kernel.

$$\beta_m\ Ln\ (g_1p_1/g_2p_2)\ Ln\ (Q_i) = \beta_m Ln\ (p_1/p_2)\ Ln\ (Q_i) + \beta_m Ln(g_1/g_2)\ Ln\ (Q_i)$$

The logarithmic price squared can be decomposed into the squared logarithmic reference area relative price, the logarithmic reference area price and factors affecting the region specific dummy variable.

$$\beta_v\ [Ln\ (g_1p/_1g_2p_2)]^2 = \beta_v\ [Ln(p_1/p_2) + Ln(g_1/g_2)]^2 =$$
$$= \beta_v\ [Ln(p_1/p_2)]^2 + 2\beta_v\ Ln(p_1/p_2) + 2\ \beta_v\ Ln(g_1/g_2) + \beta_v\ [Ln(g_1/g_2)]^2$$

The explained variable can also be decomposed.

$$Ln[C/p_2g_2] = Ln\ [C/p_2] - Ln(g_2).$$

The term $Ln(g_2)$ can be moved to the right side of the equal sign, and it is captured by the simple geographic dummy variable.

Appendix 2

CROSS-SECTIONAL LOGIT ESTIMATIONS

Explained variable = 1 if OTHERCH equals 1 at least once in 2000-2004.
N=309. In 69 cases explained variable = 1

	1	2	3	4	5
C	-0,93	-1,27	-0,78	-1,87	-1,94
	(-6.0)	(-1.0)	(-0.6)	(-0.7)	(-0.7)
U_{i1999}	1,40	1,73	0,85	1,64	4,45
	(1.3)	(1.1)	(0.5)	(0.5)	(0.3)
LnTier1		0,04	-0,02	0,01	0,03
		(0.3)	(-0.1)	(0.0)	(0.1)
Group1			0,31	0,49	0,54
			(1.3)	(1.2)	(1.3)
Group2			0,21	0,29	0,45
			(-0.8)	(0.7)	(1.1)
G1				0,65	
				(0.7)	
G2				-0,05	
				(-0.1)	
G3				0,24	
				(0.3)	
G4				0,21	
				(0.2)	
G5				1,17	
				(1.3)	
G6				0,13	
				(0.1)	
G7				0,77	
				(0.9)	
G8				-0,47	
				(-0.5)	
G9				0,13	
				(0.1)	
G-Urban				-1,11	
				(-1.0)	
U_{i1999} * UnivEduc					-3,33
					(-0.8)
U_{i1999} * Ln(Tier1)					-0,18
					(-0.1)
UnivEduc					0,09
					(0.2)
Mc Fadden R squared	**0,01**	**0,01**	**0,01**	**0,04**	**0,02**
LR Stat	**1,66**	**1,72**	**3,68**	**13,71**	**5,46**
Prob of LR stat	**0,20**	**0,42**	**0,45**	**0,47**	**0,60**

Statistically significant variables are not denoted by stars because not a single variable is statistically significant at the 10 % level.

Gs are geographic dummy variables
UnivEduc= 1 if the manager has a university degree in any discipline, zero otherwise.

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